



THE ORANGE ISIBLE INFRARED IMAGING PECTROMETER



Comparison of MODTRAN 4.x Modeled Radiance with AVIRIS Measured Radiance in the Solar Reflected Spectrum

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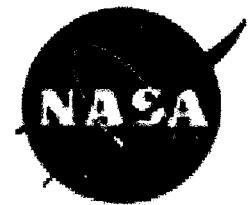


focus of talk

- ◆ description of AVIRIS instrument
 - imaging spectrometer
- ◆ in-flight radiometric cal technique
 - implications for MODTRAN
- ◆ results using MODTRAN3
- ◆ results using MODTRAN4
- ◆ analysis and comparison

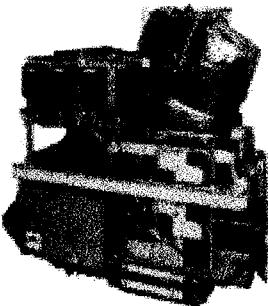


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AVIRIS instrument

- ◆ imaging spectrometer on ER-2 platform
- ◆ 224 channels between 370 and 2500nm (~ 10nm resolution)
- ◆ sufficient resolution to examine MODTRAN's modeling of some gas absorptions in the solar reflected spectrum



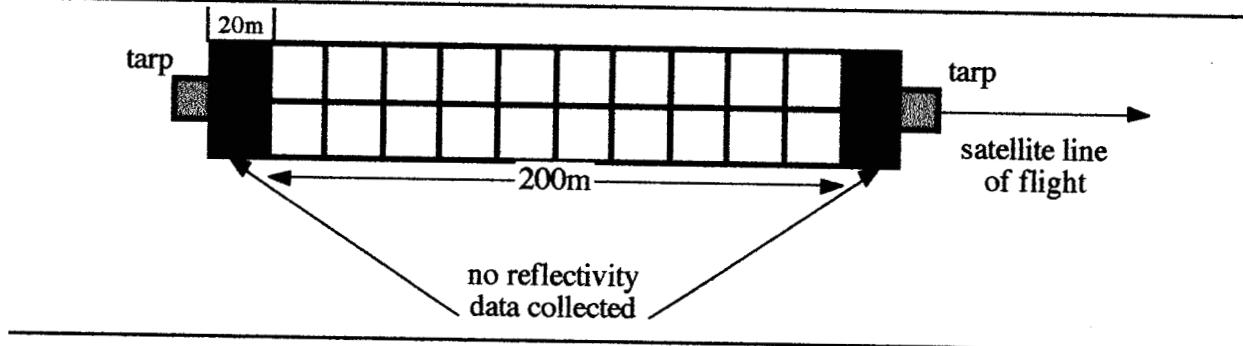
sites for radiometric calibration

- ◆ large extent
 - several km in dimension
- ◆ bright
 - 40% reflectivity typical of playas
- ◆ spectrally “flat”
- ◆ spatially homogeneous



in-flight radiometric calibration

- ◆ choose homogeneous region of playa
- ◆ measure reflectance of playa with portable spectrometer in target area
- ◆ locate target region in AVIRIS image
- ◆ **correct AVIRIS data for atmospheric effects to derive reflectance**
- ◆ compare results from two techniques





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deriving reflectance

- ◆ from ASD spectroradiometer data

- $$-\rho_{ASD} = \rho_{Spectralon} \cdot \frac{DN(\text{playa})}{DN(\text{Spectralon})}$$

- ◆ from AVIRIS data

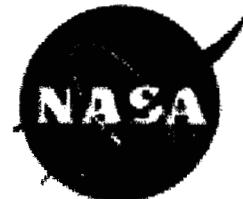
- sun photometer instrument: visibility
 - iterate MODTRAN to get water vapor

- $$-\rho_{AVIRIS} = \frac{\text{radiance}_{\text{AVIRIS}} - \text{radiance}(\rho = 0)_{\text{MODTRAN}}}{\text{radiance}(\rho = 1)_{\text{MODTRAN}} - \text{radiance}(\rho = 0)_{\text{MODTRAN}}}$$

- ◆ two radiance values compared



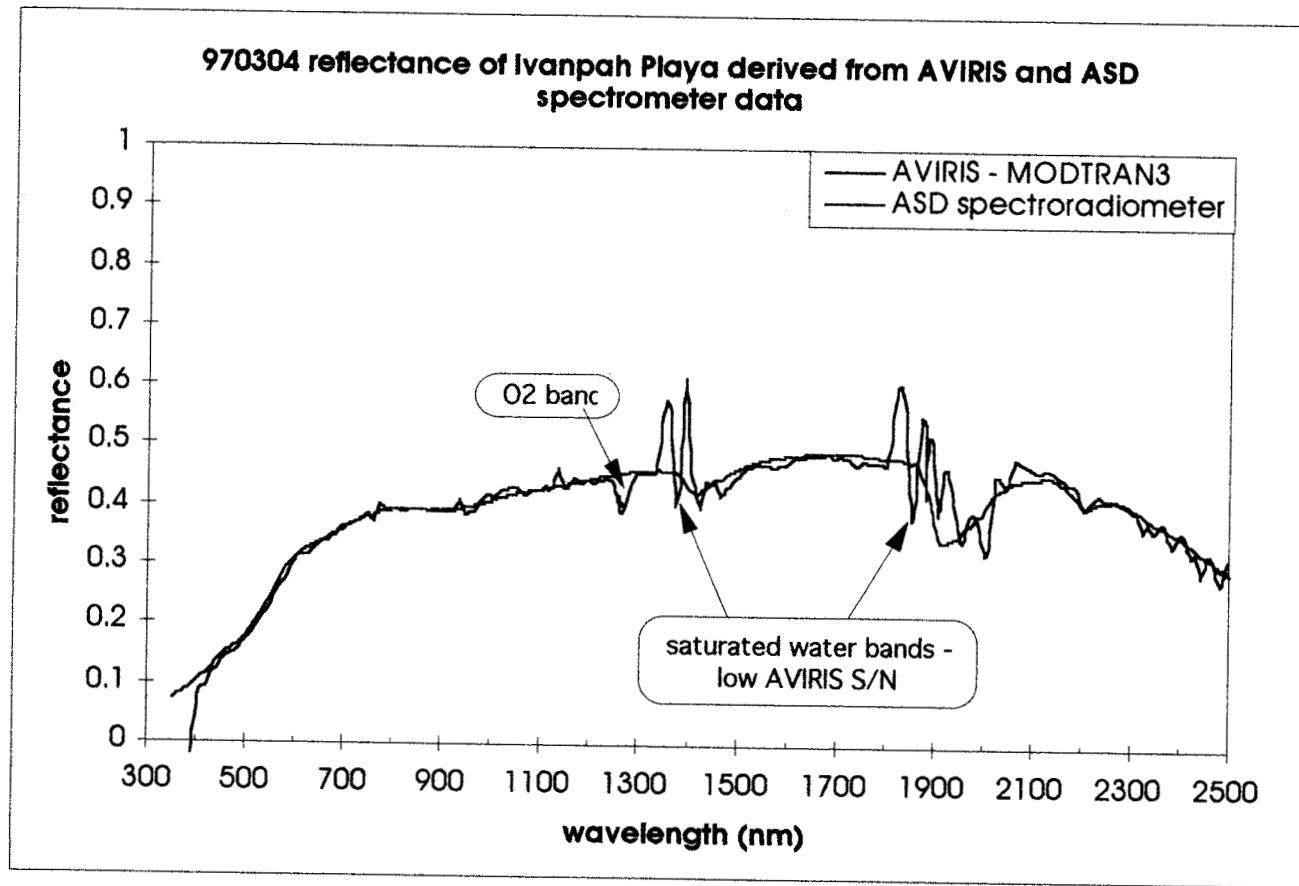
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MODTRAN inputs

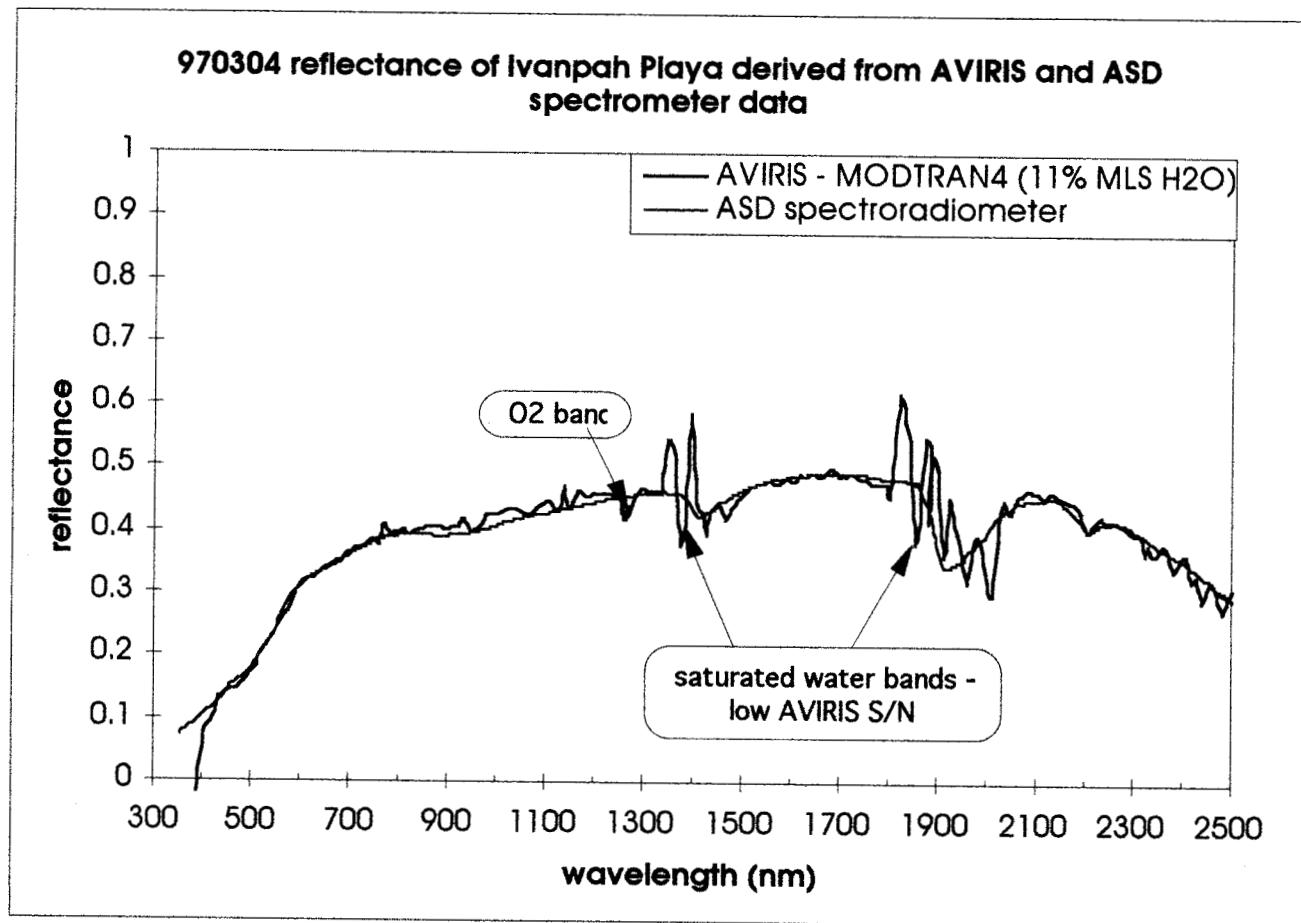
- ◆ 60km visibility, 23km rural aerosols
- ◆ MLS atmosphere, 11% scaled H₂O
- ◆ no clouds
- ◆ 20km sensor altitude, nadir-looking
- ◆ 0.8km playa surface altitude
- ◆ calculated at 5cm⁻¹ spacing
- ◆ convolved to 10nm AVIRIS SRF

results using MODTRAN3





results using MODTRAN4

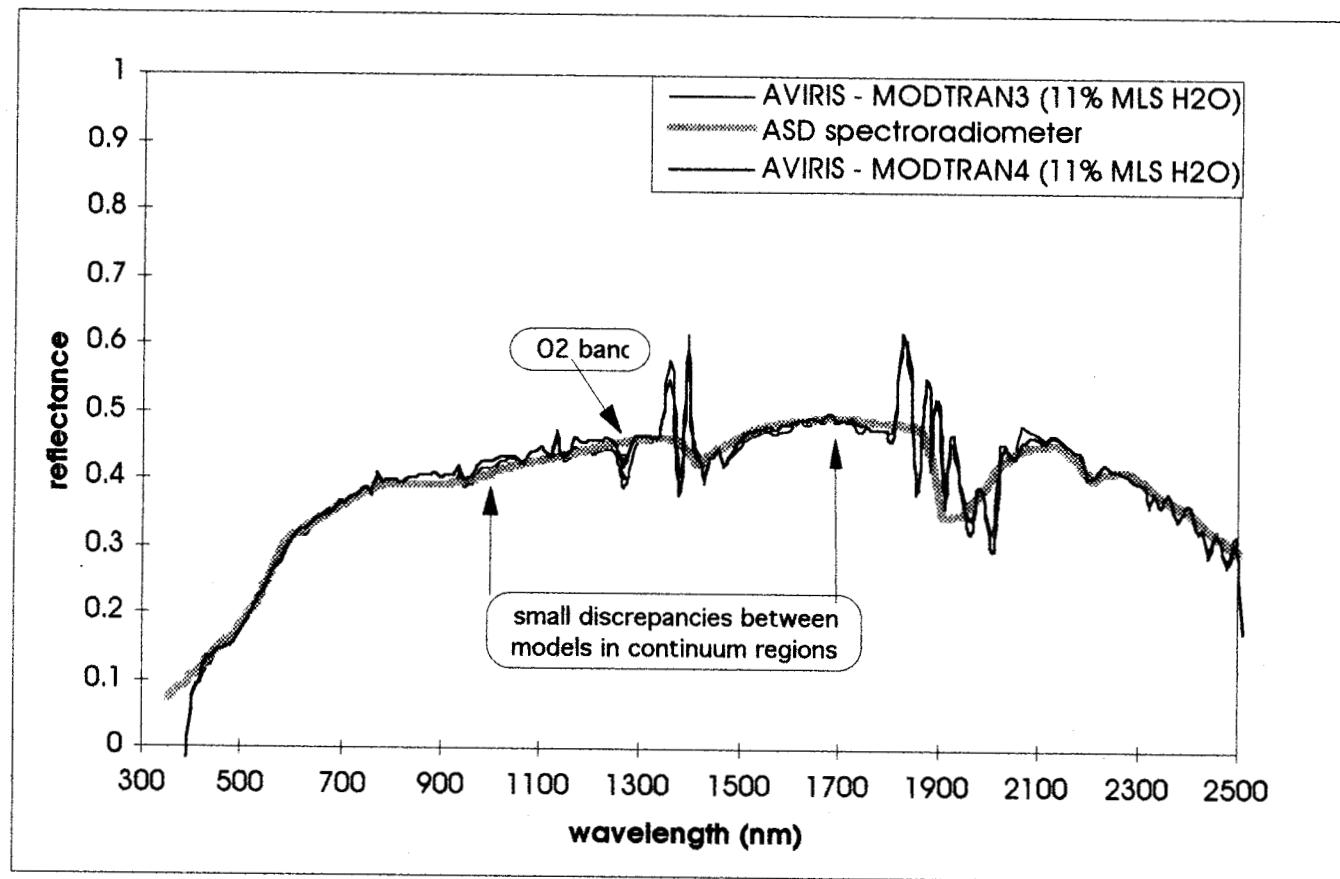




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MODTRAN 3/4 comparison





conclusions

- ◆ AVIRIS calibration experiments: a method to test MODTRAN in the reflected solar spectrum
- ◆ v. 3 and 4 provide comparable results
 - small discrepancies in continuum regions and 1290nm O₂ band
- ◆ v. 4 a better fit to 1290nm O₂ band